inches, of the female from 63·2 to 61·6 inches; while the mean weight of the former varied from 112·12 to 91·5 lbs., and of the latter from 95·2 to 76·9 lbs., showing a preponderance of the insane male of 6 lbs., and of the insane female of 8 lbs., as compared with the sane adults dying at the same period of life.

The average weight of the right cerebral hemisphere varied in the males from 20·89 oz. to 18·97 oz., and in the females from 19·21 oz. to 17·20 oz.; the left varied in the males from 21·05 oz. to 18·62 oz., and from 19·51 oz. to 17·39 oz. in the females. It is a singular fact, confirmed by the examination of nearly 200 cases at St. Marylebone, in which the hemispheres were weighed separately, that almost invariably the average weight of the left exceeded that of the right by at least the eighth of an ounce. In the Med. Chir. Trans. vol. xxxix., several cases of inequalities of the cerebral hemispheres which came under my notice are given. The average weight of the cerebellum varied in the males from 5·42 oz. to 5·06 oz., and from 5 to 4·74 oz. in the females; that of the pons Varolii and medulla in the male from 1·15 oz. to 1·02 oz., and from 1·05 oz. to ·95 oz. in the females; and that of the encephalon in males from 48·17 oz. to 43·87 oz., and in females from 44·55 oz. to 40·55 oz.; in the sane, at the same period of life, the average varied in the male from 48·2 oz. to 45·34 oz., and in the female from 43·7 oz. to 39·77 oz.

The general average weight of the lungs is shown in the Table, and the exceptions in the margin. The average weight of the heart did not reach its maximum until an advanced period of life.

In the abdominal organs nothing was observed differing essentially from those in Table No. 1.

II. "On the Electric Conducting Power of Copper and its Alloys." By A. Matthiessen, Ph.D. Received Feb. 14, 1861. Communicated by Professor W. Thomson, F.R.S.

The difference in the numerical results obtained by Prof. W. Thomson (Proceedings of Roy. Soc. 1859, x. p. 300), and those by Dr. Holzmann and myself (Phil. Trans. 1860), on the conducting power of copper and its alloys, made it somewhat necessary to re-investigate the subject, in order to ascertain the cause of these differences. For this purpose Professor Thomson kindly placed at my

disposal all his alloys; and in the following Table I will give the results of the analyses and redeterminations of the conducting power of his set. The wires were in some cases very faulty, so that I was obliged to draw them finer; others drew so badly, that the values obtained could not very well agree with those already published. After having measured their resistances, I sent them back to Prof. Thomson for redetermination. Table I. gives the results so obtained, taking the alloy containing 99·75 copper and ·25 silver=100; and Table II. the values found for some specimens of pure copper:—

TABLE I.

Composition according to Messrs. Johnson and Matthey.	Analyses of Alloy.	Specific Conductivity.		
		Values found by Professor Thomson.		Values found by myself.
		Published Values.	Redetermined Values.	
Copper 99·75..	Silver 0·24 p. c. traces of iron	100	100·1	100·37 at 17°*
Silver 0·25....	Suboxide of copper		99·9	99·73 at 17°
Copper 99·87..	Silver 0·13 p. c. traces of iron	100·7	95·8	95·44 at 17°·8
Silver 0·13....	Suboxide of copper		95·8	94·58 at 17°·8
Copper 99·75..	Lead 0·2 per cent. traces of iron	103·9	102·7	102·80 at 17°
Lead 0·25	Suboxide of copper		103·1	102·62 at 17°·6
Copper 99·75..	Tin 0·23 per cent. traces of iron	94·6	100·7	99·89 at 18°
Tin 0·25.....	Suboxide of copper		101·0	98·27 at 16°·4
Copper 99·87..	Tin 0·07 per cent. traces of iron.	96·0	97·7	97·79 at 18°
Tin 0·13.....	Suboxide of copper		98·5	97·62 at 18°
Copper 99·2 ..	Zinc, with traces of	90·2	91·3	94·71 at 15°·4
Zinc 0·8.....	iron, 1·06 per cent.		88·5	90·67 at 15°·6
Copper 98·6 ..	Zinc, with traces of	74·7	81·1	81·15 at 16°·8
Zinc 1·4.....	iron, 1·47 per cent.		80·1	80·13 at 17°·7
Copper 98·2 ..	Zinc, with traces of	..	77·9	77·8 at 16°·4
Zinc 1·8.....	iron, 1·75 per cent.		78·5	78·0 at 17°
Pure copper ..	Contained suboxide of copper	100	98·6	
Copper 99·87..	.. ..	104·7		
Lead 0·13	.. ..			

* Compared with a hard-drawn gold-silver wire of equal diameter and length, whose conducting power is equal at 0° C. to 100, these values would be 603·7 and 600·5. (See my paper "On an Alloy which may be used as a Standard of Electrical Resistance," Phil. Mag. Feb. 1861.)

TABLE II.

Composition according to Messrs. Johnson and Matthey.	Analyses of Alloy.	Specific Conductivity.		
		Values found by Professor Thomson.		Values found by myself.
		Published Values.	Redetermined Values.	
Pure copper electrotype from Messrs. De la Rue	.. ..	.. ..	107 at 9°	107·2 at 10°
Ditto from Messrs. Elkington and Co. ..	All not fused.	.. ..	107·5 at 12°	105·9 at 10°·5
Ditto from Mr. Matthews	.. ..	.. ..	108·7 at 12°	106·9 at 14°
Ditto, my own..	.. ..	.. ..	107·7 at 12°	108·1 at 10°

All the above wires were hard-drawn. On looking at the above, we find that *pure copper conducts better than any of the alloys.*

With regard to the analyses, the quantity of each specimen was so small that they could not be checked by repetition; they, however, approach very closely to the composition assigned to them by Messrs. Johnson and Matthey (with the exception of the suboxide). The traces of iron will be due to the draw-plates. I will now make a few remarks on the above results.

I. That copper containing 0·25 per cent. of silver conducts better than that with 0·13 per cent., may be explained by assuming that the first contains less suboxide than the second; for it is very possible that copper containing silver will not absorb suboxide so readily as the purer metal. It must also be borne in mind that the copper employed for making these alloys was in all probability simply electrotype copper (not fused), and that the suboxide therefore was absorbed during the process of fusing the two metals together. This assumption explains how it is that the alloys contain almost the same amount of impurity as was originally alloyed with the copper; for had the copper employed contained suboxide, we should have expected to have found greater differences in the cases of the tin, lead, and zinc alloys, as some portion of those metals would have been oxidized at the expense of part of the suboxide of copper, and escaped as oxide to the surface of the melted metal.

II. That copper containing 0·25 per cent. tin conducts better than that containing 0·13 per cent., may also be explained by assuming that they absorbed different amounts of suboxide during the process of fusion; for although tin, in presence of suboxide of copper, would be oxidized, yet copper retains the suboxide so tenaciously, that portions will always remain with the copper.

III. The fact that the conducting powers of the alloy of copper containing 0·25 per cent. lead approaches the nearest of those which I analysed to that of pure copper, is, in my opinion, a proof that the alloy is probably a mechanical mixture of copper, traces of lead, and enough suboxide to allow its being drawn into wire, and not a solution of lead in copper; otherwise a much lower conducting power ought to have been found; for, according to my own experiments, it requires twice as many volumes per cent. of lead as of tin to reduce (within certain limits) the conducting power of a metal (bismuth, silver, &c., and copper, for it belongs to the same class) to the same value: thus, to reduce the conducting power of silver to 67, it would require 0·9 volume per cent. of lead, or about 0·4 volume per cent. of tin; to reduce it to 47·6, it would require 1·4 volume per cent. of lead, or 0·7 volume per cent. of tin, &c. (Phil. Trans. 1860). Dr. Holzmann and myself repeatedly tried to draw pure copper alloyed with 0·25 of lead without success; the alloy was perfectly rotten, which also seems to indicate a mechanical mixture.

IV. It is curious that the zinc alloys contained no suboxide.

The reason, therefore, of the difference in our results is simply that Messrs. Johnson and Matthey did not use those precautions in fusing their copper and its alloys which are necessary to ensure good results; for had they taken those precautions to prevent the absorption of oxygen by their copper and its alloys which Dr. Holzmann and myself did, and which are fully described in our paper on the subject (Phil. Trans. 1860), the lead-copper alloys which they supplied to Prof. Thomson would not have been superior in conductive quality to the unalloyed electrotype copper; and he would have been led to the same conclusion as that which Dr. Holzmann and myself arrived at, namely, *that there are no alloys of copper which conduct better than pure copper*. Professor Thomson, in his paper, states that it is his opinion that the differences he observed in the conducting powers of his alloys must depend upon very small ad-

mixtures of probably non-metallic impurities. This conclusion is completely borne out by the above, as well as by the investigation carried out by myself in conjunction with Dr. Holzmann.

The results obtained by Prof. Thomson show the marked influence of traces of foreign metals on the conducting power of pure copper,—which is fully confirmed in our research on the same subject. Professor Thomson's best-conducting alloy has a much higher conducting power than those found by some experimenters for electrotype copper; but it must be remembered that in all probability the copper had been previously fused, and therefore contained suboxide of copper. The fact that electrotype copper may be drawn without having been previously fused is, I believe, generally not known; Professor Buff of Giessen first drew my attention to it, and stated that he always obtained high values for the conducting powers of electrotype copper when drawn without previous fusion. I can confirm this statement, having tested a great many specimens, and found the values in all cases nearly the same.

March 7, 1861.

Major-General SABINE, R.A., Treasurer and Vice-President, in the Chair.

In accordance with the Statutes, the Secretary read the names of the Candidates for election into the Society as follows:—

Somerville Scott Alison, M.D.
Alexander Armstrong, M.D.
Lucas Barrett, Esq.
Charles Spence Bate, Esq.
Henry Foster Baxter, Esq.
Alexander Theophilus Blakely, Capt. R.A.
Sir Charles Tilstone Bright.
William White Cooper, Esq.
Joseph Cubitt, Esq.
Richard Cull, Esq.
Henry Duncan Preston Cunningham, Esq.
Heinrich Debus, Esq.
Campbell De Morgan, Esq.
Thomas Rowe Edmonds, Esq.
Alexander John Ellis, Esq.
James Fergusson, Esq.
John Braxton Hicks, M.D.
Thomas A. Hirst, Esq.
The Rev. Abraham Hume, D.C.L.
Henry Letheby, B.M.
Waller Augustus Lewis, Esq.
A. Matthiessen, Esq.
Henry Maudslay, Esq.
J. Clerk Maxwell, Esq.